

a sleeve having an external screw thread and being fitted into the bolt hole of the first casing half by engaging the external screw thread of the sleeve with the internal screw thread of the bolt hole of the first casing half; and

23 a fastening bolt provided with an external screw thread at one end for engaging the internal screw thread of the bolt hole in the second casing half and fastening means at the portion apart from said external screw thread, said fastening bolt passing through the bolt hole of the first casing half and the sleeve therein, wherein said fastening means abuts an end of the sleeve opposite to the joint face when the fastening bolt is screwed into the bolt hole in the second casing half, whereby a tensile force generated in the fastening bolt by screwing the fastening bolt into the bolt hole in the second casing half is first transferred from the fastening bolt to the sleeve through the abutment of the fastening means and the end face of the sleeve, then transferred from the sleeve to the first casing segment through the engagement of the external screw thread of the sleeve and internal screw thread of the bolt hole in the first casing half and generates a fastening force for pressing the first casing half against the second casing half.

33 4. (Twice Amended) A fastening arrangement as set forth in claim 2, wherein an external screw thread is provided on a shaft portion of the fastening bolt and a nut engaging said external screw thread acts as the fastening means for abutting the end face of the sleeve.

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-4 are pending in this application. Claims 1, 2 and 4 have been amended to correct minor errors in the claims. In addition, the claims now recite that the bolt hole

extends **tangentially** in the walls of the casing halves. Basis for this is found in the figures and at page 4, line 1.

Claim 1 was rejected under 35 U.S.C. § 102(b) as anticipated by Swiss patent 171,458; Claims 1-4 were rejected under 35 U.S.C. § 103(a) as unpatentable over Walsh in view of Swiss patent 171,458; Claims 1-4 were rejected under 35 U.S.C. § 103(a) as unpatentable over Applicant's applied prior art (AAPA) Figure 7 in view of Swiss patent 171,458; Claims 1-4 were rejected under 35 U.S.C. § 103(a) as unpatentable over AAPA Figure 8.

Applicant thanks the Examiner for the courtesy of an interview extended to Applicant's representatives on October 7, 2002. During the interview, the differences between the present invention and the applied art were discussed. In particular, Applicant pointed out that the flange in Swiss patent 171,458 is not a wall separating the inside of the pipe from the outside of the casing. No agreement was reached pending the Examiner's further review when a response is filed.

As already discussed, it is desirable to use a casing without flanges because the presence of flanges may cause large thermal stresses in the casing. In particular, if the casing is provided with flanges having a thickness different than other portions of the casing, distortion of the casing may occur when the temperature throughout the different casing portions varies (specification, page 2, line 26 - page 3, line 11).

In order to solve the problem associated with temperature changes, a flangeless horizontal split type casing may be used. As illustrated in Figure 8, the casing halves are flangeless and the bolt holes for fastening bolts are drilled in the tangential direction in the walls of the casing halves, i.e., *the walls separating the interior of the casing from the exterior of the casing*. Spot facings are formed on the upper ends of the bolt holes in order to obtain a close contact between the surface of the casing half 210a around the bolt holes 210c

and the bolt heads 215d of the fastening bolts 215 (specification page 3, line 35 - page 4, line 6).

However, since spot facings 210d are provided, the diameters "d" of the bolt holes 210c above the spot facings are required to be as large as the diameters of the spot facings 210d (specification, page 4, lines 17-20). Therefore, the diameter of the bolt holes 210c becomes much larger than the minimum diameter required for allowing the bolt 215 to pass therethrough (specification, page 4, lines 21-23), and so the wall thickness t_1 becomes narrow at a portion where the spot facings are formed, thereby weakening the wall.

It is thus desirable to reduce the area of the spot facings 210d in order to avoid excessive reduction of the wall thickness. However, the area of the spot facings must be sufficient to accept the large tensile force which is transferred from the fastening bolts to the casing 210 through the contact between the bolt heads 215d and the spot facings 210d. That is, the area of the spot facing must be sufficiently large that the pressure on the material of the casing will not damage the casing.

According to the invention, and referring to the non-limiting embodiment, a cylindrical sleeve 11 made of a high strength material is inserted in the bore 7 of the casing wall 1. The allowable contact pressure between the enlarged diameter portion 5c of the bolt 5 and the upper end face 11a of the high strength sleeve material can be much greater than that in the case where the bolt head of the fastening bolt 5 directly contacts the casing 1. Consequently, the outer diameters of the enlarged portion 5c of the bolt 5 and the sleeve 11 may be set at a value smaller than the diameter "d" of the spot facing required in the configuration where the bolt head directly contacts the upper casing, and so the thinning of the casing wall can be minimized.

It may be appreciated that the problem to be solved by the aforementioned inventive feature is one which is specific to bolt holes formed in the casing walls, i.e., in the walls

separating the interior of the hollow casing from the exterior of the hollow casing – *a large diameter or large area spot facing in a flange would not result in a thinning or weakening of the flange*. The claims had therefore been amended to recite that the bolt holes are in “walls of the casing segments separating an interior of a hollow casing from an exterior of the hollow casing.” This is not true in the applied prior art.

Claim 1 was rejected under 35 U.S.C. § 102(b) as anticipated by Swiss patent 171,458 ('458). The examiner there alleges that the flanges 3 and 4 are considered to be a part of the walls separating an interior of the casing from an exterior of the casing because they are formed integrally therewith, e.g., they are not formed as separate parts from the casing walls. This is respectfully traversed.

It is undeniable that flanges, per se, do not separate the inside of the casing from the outside. It is only because the flanges are formed unitary with the casing walls in Swiss patent '458 that the examiner has proposed the outstanding rejection. But the fact that the flanges are formed unitary with the casing walls does not make the flanges indistinguishable from the casing walls. In any case, the claims now recite that the bolt holes extend tangentially in the walls. It is this tangential arrangement that causes the wall thinning that the invention seeks to minimize. **The flange mounted bolt holes in the Swiss patent do not extend tangentially**, and so the present claims are not anticipated by this reference.

Claims 1-4 were rejected under 35 U.S.C. § 103(a) as unpatentable over Walsh in view of Swiss patent '458. Claims 1-4 are also rejected under 35 U.S.C. § 103(a) as unpatentable over AAPA Figure 7 in view of Swiss patent '458. These rejections are also respectfully traversed.

The Office Action indicates it would have been obvious at the time the invention was made to a person of ordinary skill to form the casing of Walsh or AAPA Figure 7 with the fastening and sleeve arrangement of Swiss patent '458 for the purpose of reducing leaking by

preventing the expansion differences between the bolt, nuts and casing from permanently changing the form of the bolts, nuts or casing.

However, both Figure 1 of Walsh and AAPA Figure 7 merely disclose a split case including mating flanges or flat plates disposed at the exterior of the casing. Further, in Figure 1 of Walsh and AAPA Figure 7, axial spaced holes are formed in the flanges and in a direction do not extend tangentially in the walls. Also, Swiss patent '458, as discussed, discloses bolt holes disposed in the flanges and not in a direction not tangential to the walls. Accordingly, no combination of Walsh, AAPA Figure 7, or Swiss patent '458, could provide a bolt hole crossing the joint faces and extending tangentially in walls of both casing halves, the walls of the casing halves separate an interior of the split type hollow casing from an exterior of the split type casing wall, as recited in Claim 1.

Claims 1-4 were rejected under 35 U.S.C. § 103(a) as unpatentable over AAPA Figure 8 in view of Swiss patent '458. The Office Action indicates it would have been obvious to one of ordinary skill in the art to form the casing of AAPA Figure 8 with the fastening and sleeve arrangement of Swiss patent '458. This rejection is respectfully traversed.

AAPA Figure 8 illustrates the problem arising with tangential bolt holes in flangeless pipe casings: unnecessary thinning of the casing due to large bolt hole diameters. The invention overcomes this problem by use of a high strength sleeve, which permits a smaller bolt hole size. Thus, the sleeve in combination with the tangential bolt hole overcomes a problem unique to tangential bolt holes, i.e., one that does not arise for configurations in which the bolt holes are in laterally extending flanges. There is thus a synergy for the use of a sleeve in a tangential bolt hole. Such synergy is evidence of unobviousness. MPEP § 2141 ("A requirement for 'synergism' or a 'synergistic effect' is nowhere found in the statute, 35

U.S.C. When present, for example in a chemical case, synergism may point toward nonobviousness, but its absence has no place in evaluating the evidence on obviousness”).

In contrast, Swiss ‘458 provides non-tangential bolt holes in flanges. While it has sleeves, they would not provide the synergy achieved according to the invention. In view of this synergy, and the lack thereof in any combination of the admitted prior art of Figure 8 and Swiss ‘458, Applicant respectfully submits that the claimed invention represents an unobvious advance over any combination of these references.

Therefore, it is respectfully submitted independent Claim 1 and each of the claims depending therefrom are allowable over the prior art.

The specification has been amended in light of the objection thereto noted in the outstanding Office Action. In particular, on page 1, line 28 “consists” has been amended to be --consisting--. Accordingly, it is respectfully requested this objection be withdrawn.

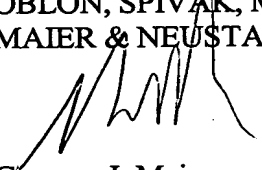
The claims have been amended in light of the objection thereto in the outstanding Office Action. Accordingly, it is respectfully requested this objection be withdrawn.

Claims 1 and 4 have also been amended in light of the rejection under 35 U.S.C. § 112, second paragraph, in the outstanding Office Action. In particular, in Claim 1, “the hollow casing” has been amended to be a --a hollow casing--. In Claim 4, line 3, “the fastening element has been amended to be --the fastening means--. Accordingly, it is respectfully requested this rejection be withdrawn.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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IN THE SPECIFICATION

Please replace the paragraph at page 1, line 27 to page 2, line 18, with the following text:

--In Fig. 7, reference numeral 100 designates a casing [consists] consisting of two casing halves 110a and 120a. 110b and 120b designate flanges formed at the joint portions of the casing halves 110a and 120a. The flanges 110b and 120b are fastened together by a plurality of fastening bolts 115. Each of the fastening bolts is provided with a bolt head 115d at one end thereof and a screw thread 115a at the other end thereof. Threaded bolt holes 120c which engage the screw threads 115a of the bolts 115 are provided on the flange 120b of one of the casing halves 120a. Further, the flange 110b of the other casing half 110a is provided with bolt holes 110c. In order to joint two casing halves 110a and 120a, the fastening bolts 115 are inserted into the bolt holes 110c of the flanges 110b of the casing half 110a and the threads 115a of the bolt 115 are screwed into the threaded bolt holes 120c on the flanges 120b of the casing half 120a until the bolt heads 115d are pressed against the upper face of the flange 110b. By tightening the fastening bolt 115, the flanges 110b and 120b are firmly pressed against each other by the bolt heads 115d and the screw threads 115a of the bolt 115. In this condition, the tensile force is generated on the shaft of the bolt by tightening the bolt 115. The reaction force of the shaft tensile force is exerted on the upper face of the flange 110b through the bolt heads 115d and also on the screw threads of the threaded bolt holes 120c in the opposite direction. Due to these reaction forces, the flanges 110b and 120b are pressed against each other.--

IN THE CLAIMS

Please amend Claims 1, 2 and 4 as follow.

--1. (Twice Amended) A fastening arrangement for a split casing assembled by fastening a plurality of casing segments, comprising:

a first and a second casing [segments] segment assembled together by joining joint faces of the respective segments, said first and second casing segments are provided with bolt holes in such a manner that the bolt hole of the first casing segment and the bolt hole of the second casing segment align with each other and, when the first and the second casing segments are assembled together, form a continuous bolt hole crossing the joint faces and extending tangentially in walls of both casing segments, the walls of the casing segments separating an interior of [the] a hollow casing from an exterior of the hollow casing, and at least the bolt hole in the first casing segment is provided with an external screw thread;

a sleeve having an external screw thread and being fitted into the bolt hole of the first casing segment by engaging the external screw thread of the sleeve with the internal screw thread of the bolt hole of the first casing segment; and

a fastening bolt provided with fastening means and passing through the bolt hole of the first casing segment and the sleeve therein, wherein said fastening means abuts an end of the sleeve opposite to the joint face and, when a tensile force is exerted on the fastening bolt at the portion between the fastening means and the second casing [segments] segment, the tensile force is first transferred from the fastening bolt to the sleeve through the abutment of the fastening means and the end face of the sleeve, then transferred from the sleeve to the first casing segment through the engagement of the external screw thread of the sleeve and internal screw thread of the bolt hole and generates a fastening force for pressing the first casing segment against the second casing segment.

2. (Twice Amended) A fastening arrangement for a horizontally split type hollow casing for a hydraulic machine in which the casing of the hydraulic machine is assembled by fastening two casing halves, comprising:

a first and a second casing [halves] half assembled together by joining joint faces of the respective casing halves, said first and second casing halves are provided with bolt holes in such a manner that the bolt hole of the first casing half and the bolt hole of the second casing half align with each other and, when the first and the second casing halves are assembled together, form a continuous bolt hole crossing the joint faces and extending tangentially in walls of both casing halves, the walls of the casing halves separating an interior of the split type hollow casing from an exterior of the split type hollow casing, said bolt holes in the first and the second casing halves are provided with internal screw threads;

a sleeve having an external screw thread and being fitted into the bolt hole of the first casing half by engaging the external screw thread of the sleeve with the internal screw thread of the bolt hole of the first casing half; and

a fastening bolt provided with an external screw thread at one end for engaging the internal screw thread of the bolt hole in the second casing half and fastening means at the portion apart from said external screw thread, said fastening bolt passing through the bolt hole of the first casing half and the sleeve therein, wherein said fastening means abuts an end of the sleeve opposite to the joint face when the fastening bolt is screwed into the bolt hole in the second casing half, whereby a tensile force generated in the fastening bolt by screwing the fastening bolt into the bolt hole in the second casing half is first transferred from the fastening bolt to the sleeve through the abutment of the fastening means and the end face of the sleeve, then transferred from the sleeve to the first casing segment through the engagement of the external screw thread of the sleeve and internal screw thread of the bolt hole in the first

casing half and generates a fastening force for pressing the first casing half against the second casing half.

4. (Twice Amended) A fastening arrangement as set forth in claim 2, wherein an external screw thread is provided on a shaft portion of the fastening bolt and a nut engaging said external screw thread acts as the fastening [element] means for abutting the end face of the sleeve.--